Audio Engineering Associates

- STUDIO RIBBON MICS
- MIC POSITIONERS
- TALL STANDS
- ACCESSORIES

AEA $RP_{48}Q$ Ribbon Preamp with Curve Shaping

Operating Manual

© February 2009

Introduction

The AEA $RP_{48}Q$ Ribbon Preamp with Curve Shaping provides two channels of high-quality, high-gain, low-noise microphone preamplification. Particularly well suited for use with ribbon microphones, it delivers the speed, precision, quietness, and headroom needed for today's high resolution recordings. The JFET circuitry design generates up to 80 dB of clean and quiet gain, with extended bandwidth from below 1 Hz to beyond 200 kHz, for dynamic range and transient response that complements all of your microphones.

Unique to the $RP_{48}Q$, the separate microphone inputs offer you the choice of either DC coupling, for microphones that neither want nor need phantom power (such as ribbon, moving-coil, or self-powered condenser microphones) or AC coupling with switchable full-spec P48 phantom power, for phantom powered condenser or ribbon microphones.

Bypassable Curve-Shapers—low frequency trim and high frequency boost circuits, both with variable break frequency selection—provide full and intuitive control. These filters enable you to minimize proximity effect or low-frequency environmental noise without compromising the bass content of the program and/or add just the right amount of high-frequency presence boost or "air" at the top.

To complete the system in this rugged 1 RU package, the $RP_{48}Q$ provides a polarity invert switch and LED level indicators for each channel as well as balanced outputs capable of driving +28 dBu into 600Ω and unbalanced outputs capable of driving +22 dBu into 100 kΩ loads. The recommended load for the unbalanced output is > 10 kΩ. All outputs may be used simultaneously. The unit is factory-wired for either 120 VAC or 240 VAC operation.

The Front Panel

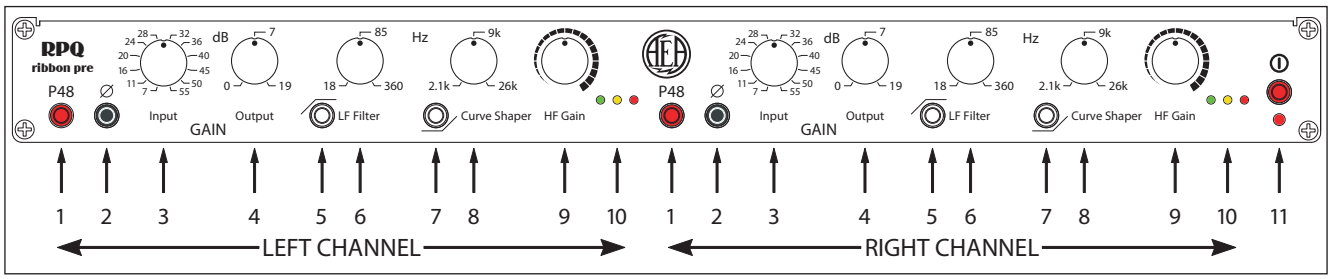

Figure 1: AEA $RP_{48}Q$ Front Panel Diagram

1029 N. Allen Ave. Pasadena CA 91104 www.ribbonmics.com Phone: (626) 798-9128 Fax: (626) 798-2378

1 – **Phantom Power switch**: OUT is off; IN applies full-spec P48 phantom power to the AC-coupled input (see #17 on Back Panel): 48 VDC / 10 mA per channel under any load condition.

2 – **Polarity Invert switch**: OUT is normal; IN is inverted.

3 – **Input Gain**: this twelve-position switch selects from +7 dB to +55 dB of preamplifier gain, as measured between the input and the unbalanced output; at all settings, the balanced output is +6 dB higher.

4 – **Output Gain control**: this continuously variable control provides from +0 dB to +19 dB additional output gain, following the Curve-Shaper circuitry, for both the balanced and unbalanced outputs.

5 – **LF Filter switch**: OUT is bypass; IN inserts the 20 dB low-cut shelving filter.

6 – **LF Filter Tuning**: this continuously variable control adjusts the -3dB break-frequency of the filter from 18 Hz to 360 Hz; maximum LF reduction is -20dB.

7 – **Curve-Shaper IN/OUT switch**: OUT is bypass; IN inserts the Curve-Shaper circuitry.

8 – **Curve-Shaper Tuning control**: this continuously variable control adjusts the +3dB break-frequency from 2.1 kHz to 26 kHz.

9 – **HF Gain control**: this continuously variable control adjusts the HF gain from flat (+0dB) to maximum (+18 dB); the slope of the HF filter varies interactively and directly with the boost frequency and gain settings.

10 – **Audio Signal Level indicators**: referenced to the signal level at the unbalanced output, the Green LED snaps on at -5 dBu to indicate the presence of signal; the Red LED snaps on at +20 dBu to warn of approaching signal overload; the Yellow LED varies in brightness with the signal level from 0 dBu to +20 dBu. The signal level at the balanced output is +6 dBu higher than the unbalanced output.

11 – **AC Power On/Off switch and indicator LED**: OUT is off; when IN the unit is on and the indicator LED is illuminated.

The Back Panel

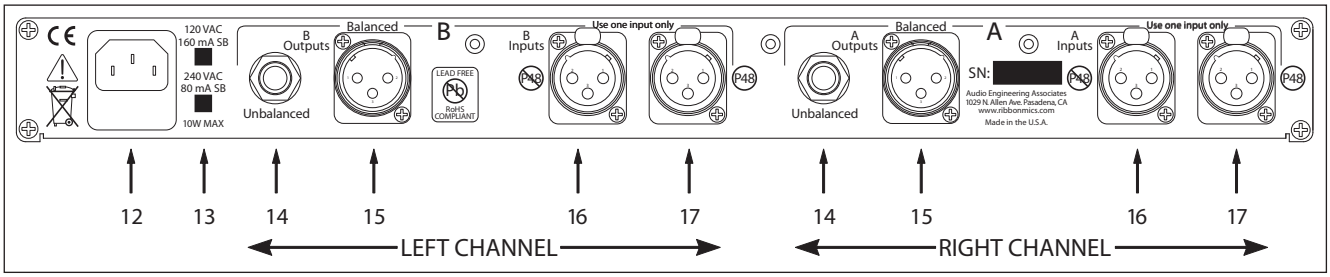

Figure 2: AEA $RP_{48}Q$ Back Panel Diagram

12 – **AC Mains power input receptacle with integral fuse holder**: use a 160 mA slow-blow fuse for 120 VAC operation or a 80 mA slow-blow fuse for 240 VAC operation.

13 – **Operating Voltage Checkmark**: indicates the internal factory wiring for the operating voltage, 120 VAC or 240 VAC.

14 – **¼" TRS jack Unbalanced Output**: provides maximum output of +22 dBu; 100 kΩ load. The recommended load is > 10 kΩ.

15 – **XLR Balanced Output**: provides maximum output of +28 dBu, balanced or +22 dBu, unbalanced; 600Ω load.

Note: At any gain setting, the balanced output is always +6 dBu higher than the unbalanced output. (0 dBu = 0.7746 V rms)

16 – **DC-coupled Microphone input**: this input has no phantom power applied and is intended for use with microphones do not need phantom power, such as ribbon, moving-coil, or self-powered condenser microphones; the low-frequency response is -3dB at < 0.1 Hz; input impedance is > 10 kΩ.

17 – **AC coupled Microphone input**: this input provides switchable full-spec P48 phantom power (see Switch # 1 on Front Panel) for use with phantom-powered condenser or ribbon microphones, etc.; low-frequency response is -3dB at < 1 Hz; input impedance is > 10 kΩ.

Note 1: Each channel has a DC-coupled and an AC-coupled input. Use only one of these inputs with each channel at a time.

Note 2: Connector polarity:

XLR: pin-1 is ground, pin-2 is high, and pin-3 is low
TRS: tip is high, ring is tied to ground, sleeve is ground

Note 3: No user serviceable or adjustable parts inside. Do not open the case.

Initial Setup

Before connecting the AC Mains power (ref. #12), check that the unit has been wired for the proper voltage (ref. #13). To ensure electrical safety and correct signal grounding, confirm that the AC source outlet is properly grounded and never defeat the ground-pin connection on the AC power cord.

Do not place this unit on or in close proximity to any object that emits strong electro-magnetic fields, such as power transformers, motors, or RF transmitters. While the $RP_{48}Q$ is well shielded against external fields, it is, after all, a very high-gain amplifier.

Similarly, do not place this unit on any surface that is hot to the touch or where it can become overheated.

Before turning on the power, all connections to this unit should be made and the Gain controls (ref. #3 and #4) set at their minimum (fully counterclockwise) settings. Also before powering on this unit, be sure that the next item in the signal chain is turned down to prevent any sudden loud noises from damaging your system or hearing.

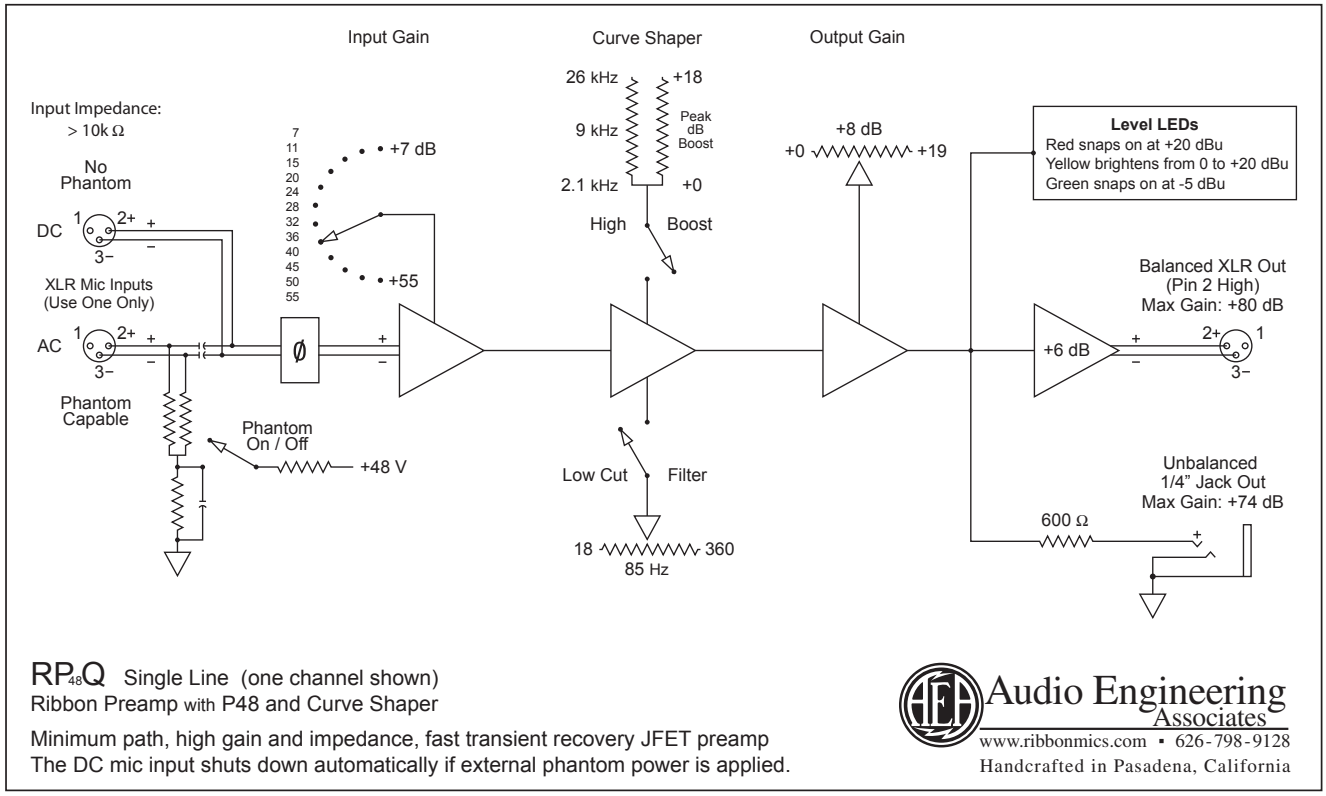

Figure 3: AEA RP48Q Single Line Diagram (one channel shown)

Input Connections

Ribbon microphones, moving-coil dynamic microphones, and any other microphones that do not use phantom power to operate normally should be connected to the DC-coupled inputs (ref. #16). Alternatively, they may be connected to the AC-coupled inputs (ref. #17), but make certain that the Phantom Power switch (ref. #1) is OUT/OFF before and while they are connected to prevent possible damage to the microphones.[1]

Condenser microphones or powered ribbon microphones that require P48 phantom power should be connected to the AC-coupled inputs (ref. #17), and the Phantom Power switch (ref. #1) should be IN/ON. Each input is capable of providing full-spec 10 mA current to the microphone under any load condition.

Depending on the types of microphones being used, it is not necessary to use the same type of input for each channel: choose the input that is best suited for each microphone. The low frequency response of the DC-coupled input is -3 dB < 0.1 Hz, and of the AC-coupled input is -3 dB < 1 Hz. The input impedance of both inputs is > 10 kΩ. Polarity is: pin-1, ground; pin-2, high; pin-3, low.

Use only one input per channel. Do not use both inputs for any channel at the same time.
When using lower output microphones, such as ribbons, best performance will be achieved if the cables between the mics and the preamp are as short as possible. This will minimize any noise pick-up by the cables. Just place the preamplifier near the base of the microphone stands, and then run the

[1]The DC-coupled inputs are protected from 48V phantom power. If phantom power is applied, the input circuit shuts down until the phantom power is removed.

signals at line-level back to the control room.

To prevent damaging the equipment in your system, it is a good idea to test your microphone cables regularly to determine whether they have any open, shorted, reversed, or intermittent connections.[2] Defective cables can cause absence of signal which, as Richard Heyser once commented, is 100% distortion. Even more potentially damaging, defective cables can cause loud "pops" or other noises, which if the level is high can launch loudspeaker cones across the room.

Output Connections

There are two output connectors for each channel: an XLR-male (ref. #15) and a TRS-female (¼" phone, tip-ring-sleeve) jack (ref. #14).

The **XLR** output (ref. #15) emulates a transformer-coupled output and can be used as either a balanced or unbalanced signal (depending on how your cable/system is configured). When balanced, the maximum output level is +28 dBu; when unbalanced, the maximum level is +22 dBu. (These are as measured into a 600Ω load; the recommended load is > 10KΩ). At any gain setting, the balanced output is always +6 dBu higher than the unbalanced output; 0 dBu = 0.7746 V rms. Polarity is: pin-1, ground; pin-2, high; pin-3, low.

When unbalancing the XLR output, pin-3 must be tied to ground at the receiving end (i.e. the input of the following device). Do not tie pin-3 to ground directly at the output of the $RP_{48}Q$.

If your system requires "telescoping" the shield,[3] it is recommended that the shield be disconnected at the output of the $RP_{48}Q$ and connected at the input to the next device in the signal chain.

The **TRS** jack (ref. #14) outputs an unbalanced signal, with a maximum level of +22 dBu, as measured into a 100 kΩ load; the recommended load is > 10KΩ. Either a tip-sleeve (2-circuit) or tip-ring-sleeve (3-circuit) ¼" phone plug may be used: tip is high; ring is tied to ground; sleeve is ground.

Either or both of these outputs may be used at the same time; however if the unbalanced phone jack is to be used, it should not be plugged in or out while critical signal is being passed through the XLR output, because doing so may cause a momentary drop in level.

As noted above, test your cables regularly to be sure that they are in proper working order.

Polarity Switch

OUT is normal; IN is inverted. (ref. #2) Use this switch to correct for polarity problems with microphones or cables.

---

[2] All "portable cordage" (stage or studio) microphone cables always should have pin-1 (shield) connected at both ends, and the connector shells should float and be insulated from the shield (pin-1).

[3] "Telescoping" the shield refers to a line-level cable or connection where the shield is tied to ground at only one end. Common practice recommends grounding the shield at inputs and floating it at outputs when telescoping the shield for line-level devices. Microphone cables should never have telescoping shields.

Setting the Gain

As with any piece of audio equipment, setting and maintaining proper signal levels are critical to obtaining optimum performance: if the level is too low, you sacrifice noise performance; if too high, you risk overload distortion. The AEA $RP_{48}Q$ provides an easy method for setting and monitoring the system gain.

The Input Gain control (ref. #3) provides from +7 dB to +55 dB of gain for the preamplifier input stage. The Output Gain control (ref. #4) adds up to another +19 dB of output gain, following the Curve-Shaper circuitry, for a total of +74 dB of gain as measured from the input to the unbalanced output TRS jack (ref. #14). At any gain setting, the balanced output at the XLR connector (ref. #15) is +6 dB higher in level than the unbalanced output.

The LED level indicators (ref. #10) monitor the signal level at a point in the signal path just prior to the input of the balanced output amplifier, which is the same point where the unbalanced output is derived. The Green LED comes on in the presence of low-level signal; the Red LED turns-on when you are approaching -2 dB below signal overload or "clipping." The Yellow LED varies in brightness between the two to indicate the general signal level.

Start with the Output Gain control (ref. #4) fully clockwise and the Input Gain control (ref. #3) fully counterclockwise. Then, with the microphone in position increase the Input Gain until the Red LED turns-on when the soundsource is at its loudest. If the LED is illuminated too often or too long, reduce the Input Gain control one step at a time until the Red LED illuminates only briefly at the loudest peaks. Once this setting has been determined, reduce the Output Gain control to the 2 o'clock position. This will provide you with a little extra headroom for an optimum setting of the gain of the microphone preamplifier.

Note, however, that if you subsequently apply HF boost, you may need to reduce the Input Gain control correspondingly to avoid system overload.

Also remember, the energy and excitement generated during a performance guarantees that it will always be louder than the rehearsal, so after determining the gain during the sound-check it is a good idea to set the Input Gain control one or two clicks lower for the performance to allow yet a little more margin for headroom.

Using the LF Filter

The $RP_{48}Q$ was designed to compliment ribbon microphones perfectly. AEA Big Ribbon™ mics deliver sub-woofer lows, which the $RP_{48}Q$, with response below 2 Hz, renders faithfully. Such strong low frequency content can mask high frequency intelligibility, so the tunable LF filter was engineered to reduce low frequency energy to appropriate levels.

Directional microphones when moved closer on-axis to a sound source become more sensitive to low frequencies. This proximity effect, otherwise known as "bass tip-up," becomes more pronounced the closer the distance. With some large transducer microphones such as the RCA-44 BX proximity effect begins at six feet and is extremely pronounced at a distance of one inch.

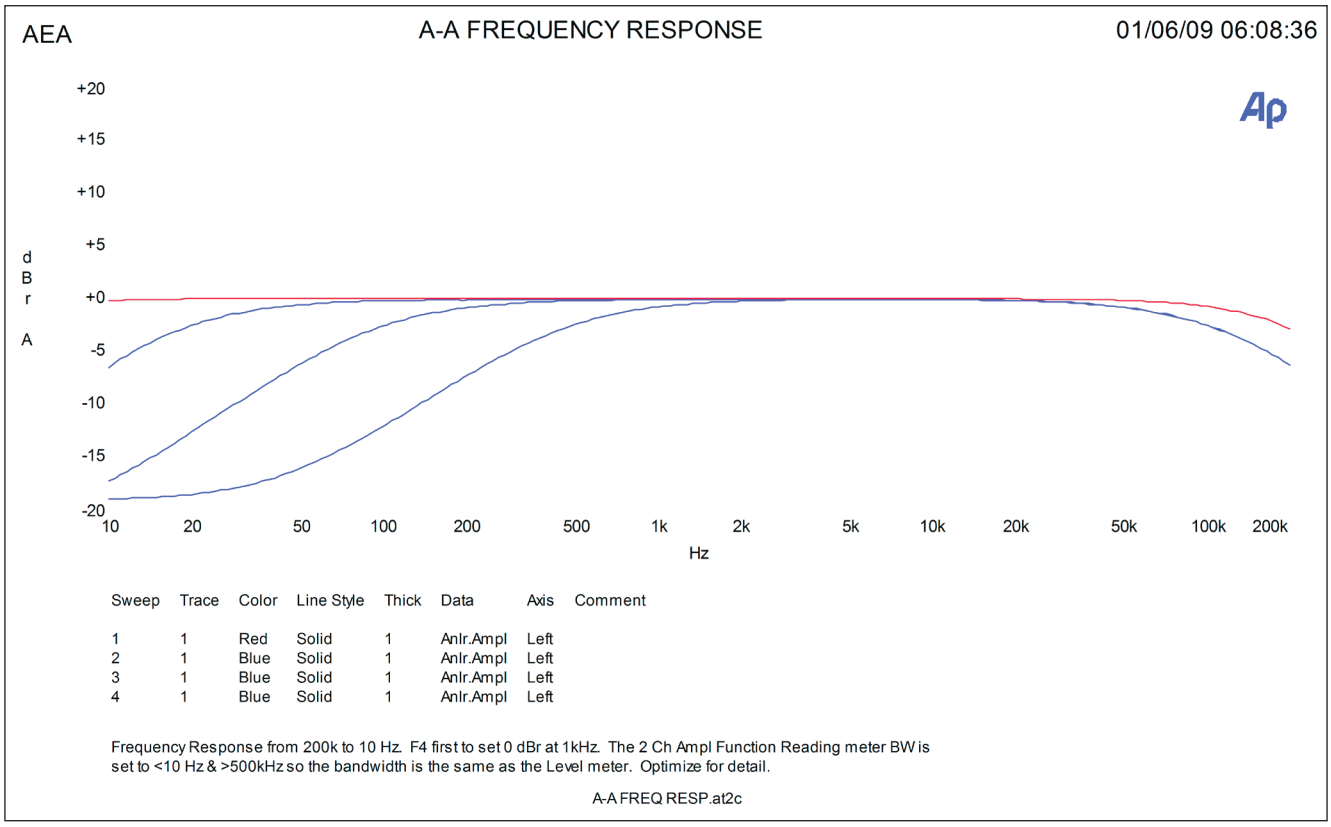

Figure 4: Response of LF Filter

LF filters tame proximity effect and reduce other unwanted low-frequency noise, such as air-conditioning rumble, traffic noise, “P-pops” and breath-noise noise. However, a fixed-frequency, constant slope low-cut filter cannot handle all situations effectively. The $RP_{48}Q$ offers a flexible LF filter that can be tailored to satisfy the varying and critical demands of both speech and music.

Pushing IN the LF Filter switch (ref. #5) inserts a - 20dB (maximum) low-cut shelving filter. The tuning control (ref. #6) adjusts the -3 dB break-frequency of the filter. Setting the filter is easy: push in the LF Filter switch and adjust the tuning control until you like the sound. Then toggle the LF Filter switch quickly to compare the result against the original. When the offending noise is reduced sufficiently but the low-frequency content of the program remains unaffected, you have achieved your goal.

Using the Curve-Shaper and HF Gain

The $RP_{48}Q$ features a unique Curve-Shaper circuit that enables you to add a little extra “presence” or “air” to the pickup to compensate for high-frequency losses that are inherent to most ribbon microphones, the result of distant mic placement, or an overly “dry” acoustical environment. This circuit functions similarly to a conventional parametric shelving boost, but with a significant difference: the slope varies as both the Curve-Shaper and HF Gain controls are adjusted.

Once the Curve-Shaper switch (ref. #7) is IN/ON, adjust the continuously variable Curve-Shaper control (ref. #8) to tune the filter to the +3 dB break-frequency at and above which you want to introduce the boost. Then, dial-in the amount of boost you desire with the HF Gain control (ref. #9). The two controls are interactive, so as with the LF filter, listen carefully to determine at what frequency and

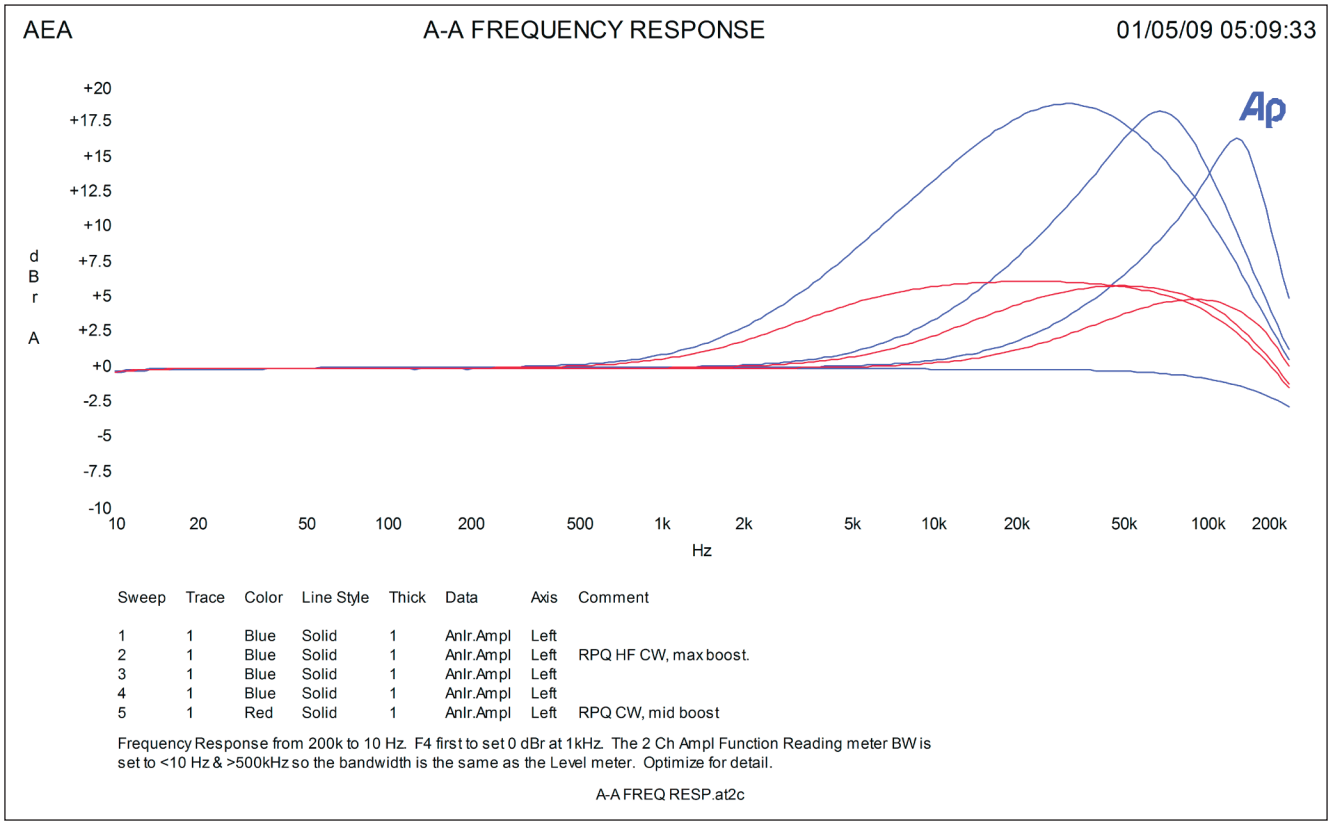

Figure 5: Response of Curve-Shaper . Red curves show HF Gain at half-boost, blue curves HF Gain at full-boost.

gain setting you achieve satisfactory results.

Be careful when you add HF gain because this also affects the overall gain structure of the preamplifier and could introduce overload distortion. After you make this adjustment, you may need to reduce the Input Gain control (ref. #3) correspondingly to compensate for the HF signal boost.

Specifications

Electronic

• 80 dB of gain at 1kHz, balanced-in to balanced-out
• Noise figure, rms A-weighted: < 2 dB
• Noise figure, rms unweighted: < 3 dB, 20 kHz LPF bandwidth
• EIN < -128 dBu A-weighted, 150 W resistive source
• Frequency response: -3dB < 1Hz and > 200 kHz
• THD: < 0.02% at 1 kHz
• Balanced Microphone Input Impedance > 10 kΩ
• DC-coupled inputs are protected from external P48 phantom power. If phantom power is applied, the input circuit shuts down until the phantom power is removed.
• AC-coupled inputs with switchable full-spec P48 phantom power; 10 mA per channel available under any load condition
• Input Gain control: twelve-position switch provides from +7 dB to +55 dB of gain for the preamplifier circuit, as measured between the input and the unbalanced output; the balanced output is +6dB

higher.
• Output Gain control: continuously variable from +0 dB to +19 dB of additional output gain, following the Curve-Shaper circuitry
• Switched LF Shelving filter: -3 dB break-frequency tunable from 18 Hz to 360 Hz; maximum reduction -20 dB
• Switched Curve-Shaper and HF Boost: +3dB break-frequency tunable from 2.1 kHz to 26 kHz; HF gain adjustable from +0 dB to +18 dB; the slope of the HF filter varies interactively and directly with the Curve-Shaper and HF gain settings
• XLR output maximum level into 600Ω load: +28 dBu, balanced; +22 dBu, unbalanced;
0 dBu = 0.7746 V rms
• TRS output maximum level into 100 kΩ load: +22 dBu, unbalanced; 0 dBu = 0.7746 V rms
• Recommended load for the unbalanced output: > 10 KΩ
• XLR connectors polarity: pin-1 is ground, pin-2 is high, pin-3 is low
• TRS connector polarity: tip is high, ring is tied to ground, sleeve is ground
• LED signal level indicators: green snaps on at -5 dBu, red snaps on at +20 dBu, and yellow varies in brightness with level from 0 dBu to +20 dBu—all referenced to the unbalanced output.

Physical

• 1 RU steel and aluminum chassis: 17.25” w, 11” d, 1.7” h (44 cm x 28 cm x 4.3 cm)
• Weight: 6.75 pounds (3.1 Kg)
• Silkscreened front and back panel markings and top panel block-diagram
• Metallic blue and steel gray powder-coat finish
• Detachable rack-ears included
• All rotary potentiometers detented at 12:00 o’clock position
• Grayhill series 71 stepped gain switch
• Internal torroidal power transformer with linear regulators
• Male recessed IEC AC MAINS connector with integral fuse holder: 160 mA slow-blow for 120 VAC operation; 80 mA slow-blow for 240 VAC operation. Factory wired internally for input voltage.

Specifications and details subject to change without notice.

WARRANTY

Audio Engineering Associates warrants the AEA $RP_{48}Q$ against defects in materials or workmanship for one (1) year from the date of purchase. For repairs to units exhibiting abnormal physical damage or that are out-of-warranty, AEA will provide a repair estimate and will not proceed with service without the customer’s authorization. Repairs will be performed at AEA’s headquarters in Pasadena, CA. Shipping and insurance costs both ways are the responsibility of the customer. Please contact AEA prior to sending the unit in for repair.

No user serviceable or adjustable parts inside. Do not open the case.

Other Products by Audio Engineering Associates:

A440 The first active 44-style microphone. Finally, the warm sound you love combined with the signal strength of a powered mic.

TRP High-Gain 2-channel half rack unit optimized for passive ribbon microphones

RCA Working Reproduction Microphones and replacement parts

AEA R44C Microphone - Museum Quality Reproduction
Our tribute to the classic RCA 44B using New Old Stock ribbon material
AEA 44CX Microphone
6db more output for critical digital recordings
AEA 44CNE Microphone
Based on RCA LTD production - the same sound but easier to build

AEA Ribbon Microphones

R84 - Studio Ribbon Mic
R88 - Stereo Ribbon Mic
R92 - Studio Ribbon Mic specifically designed for close micing and guitar

Studio Microphone Stands and Booms

Modular Microphone Positioners and Decca Trees

Since 1983 AEA has imported and serviced the Coles 4038 studio ribbon microphone and the 4104B, "lip" mic for voice-over work in high noise environments. We sell, service, and stock replacement parts.

In North America AEA represents CB Electronics, a leading worldwide supplier of machine control equipment to the sound-for-picture industry. Their products specialize in professional control of and translation between bi-phase, 9-pin serial and time code machines. Their SR line provides low cost multiple machine remote controls for RS-422, Sony, and Tascam DA88 protocol machines.

Audio Engineering Associates

• STUDIO RIBBON MICS
• MIC POSITIONERS
• TALL STANDS
• ACCESSORIES

1029 N. Allen Ave. Pasadena, CA 91104 Phone: (626) 798-9128 Fax: (626) 798-2378 www.ribbonmics.com